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Scientific and Engineering Progress— Insurance against Aggression and Depression

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Universities, industry, government, and labor, the groups through which John Q. Citizen operates, can, through scientific progress, provide insurance against aggression and depression. The public is waking to the significance of the role science plays in national welfare

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I SHALL undertake to analyze scientific progress as insurance into some of its more fundamental aspects, somewhat after the manner of an engineering analysis.

First, to provide the setting, let me comment on the rate of development of scientific progress. It would be trite to remark upon the rapidly increasing tempo of scientific progress over the past decades and as reasonably extrapolated into the foreseeable future. This increased tempo arises from several factors. New tools of great power are continually being devised, and every new tool applicable in scientific research tends to increase the rate of progress. Methods for conducting research, especially through cooperative organization and world-wide exchange of information, have a powerful accelerating effect. Every great success of science in peace or in war which profoundly affects the public leads to increased public awareness of the value of science and generally to an increased public support of scientific work. Finally, I believe, a very fundamental fact arises from the interrelationships among various scientific facts and fields. The more scientific facts or principles which are known, the greater is the opportunity for finding some combination of previous scientific knowledge which can be used to make some new scientific advance. So, in a rough sort of way, it would appear that the theoretical upper limit to the rate of scientific progress would increase almost exponentially with the amount of scientific knowledge which has at any given time been accumulated.

But there is another interesting aspect of scientific progress. This is that in any given field scientific knowledge does not increase at a smoothly accelerated rate, but increases by spurts. It proceeds in fits and starts, and every one of these is due to the development of some new idea, or some great discovery, or some very powerful tool, which suddenly opens the door to another great storehouse of nature's secrets.

Some of us can remember, at the turn of the present century, when there was a general feeling in physical science that the subject had been pursued practically to its terminal point, and that very little remained except to make physical measurements to an accuracy described by one or two more decimal points. This was at the end of a great era of scientific development based upon the principles of thermodynamics. This era in turn had followed upon an earlier productive era based on the principles of dynamics, notably upon Newton's laws of motion. But even at the end of the great era of thermodynamics there were on the horizon a few gleams of the great visions which have rapidly opened up in the fields of electronics, and now of nucleonics, which have opened up vistas for exploration far exceeding any ever before envisaged.

The above examples have been picked from the fields of basic physical science. Similar illustrations could be given in the field of biological science, as, for example, the present trend, still in its infancy, to pass from a descriptive era into an era of analysis based on quantitative measurements made with some of the newer tools of physics and chemistry. This also has its repercussions in medical science and is an illustration of the interrelation of all science and of the fact that every significant advance tends to unlock great categories of nature's secrets in other fields, often unexpectedly.

In no aspect of science is the increasing tempo of progress more significant than in the fields of applied science. For many centuries the principal applications of science were the work of individual inventors, like Archimedes, or Watt or, in our lifetime, Edison. But it was also within the lifetime of most of us that industrial research laboratories came into being, and in fact in the greatest of these the original research directors who organized these laboratories are still actively with us. In these laboratories industry has rapidly developed cooperative methods for developing applications of science to meet every variety of human need and desire. And in many ways the development of methods of cooperative group attack on problems of applied science has been just as significant as the developments of science themselves. These great industrial research laboratories are now great assets both for national security and for national progress in standards of living.

The past world war brought on still another development, not new in principle but entirely new in the scope of its application and the perfection of its organization. In a nation-wide attack on important scientific problems, in which individual inventors and scientists, the organized research laboratories of universities and of industry, and the various departments of government, have combined to bring the entire resources of the country to bear on important problems. Radar, rockets and guided missiles, atomic energy, war medicine, illustrate what I mean. Thus in the fields of applied science we have a steady development of technique and organization from the individual inventor through the organized research laboratory of industry or of university to the nation-wide attack by all competent agencies on problems of national concern. If we think back over the past decades we realize to what a startling extent both the developments in fundamental science and those for applying science to meet the national problems have grown within our lifetime,

in fact within the last one or two decades.

As for insurance against aggression and depression, John Q. Citizen, individually and collectively, wants security against aggression in order that he may live his life as he wishes without outside interruption. He wants security against depression, that specter of economic disease. He is the person with greatest interest and responsibility in the subjects of aggression and depression, but what can he do about it? In order to answer this question it is necessary to look to some of the organized groups through which the collective John Q. Citizen operates—namely, his government, the business and industrial groups of management and labor, and finally the universities and other eleemosynary organizations which are concerned with education and research and which I shall speak of under the general term "universities".

Insurance against Aggression and Depression

Consider first the responsibility for insurance against aggression. Here, Mr. John Q. Citizen assigns this responsibility to his government, and especially to the Departments of War, Navy, and State. We can say that the Government has an AAA priority of responsibility for insuring our country against foreign aggression, and that, while other groups like industry and universities have an interest and should cooperate when called upon, the responsibility for insurance against aggression is squarely up to the Government.

When we come to responsibility for insurance against depression, however, we find that this responsibility is more divided and, so far as I can see, government, industrial management, and industrial labor all share about equally the responsibility to do everything possible to protect us against depression. It is the responsibility of the Government as the official representative of John Q. Citizen. It is the responsibility of industrial management and of labor because they have the major stake in profits and employment and are the first to be hit in any depression.

So far as I can see, the universities have no direct responsibility for depression. They may suffer from it and have an interest in avoiding it, and perhaps their teachings may in the long run affect the dangers of depression, but their particular activities are not directly contributory to depressions.

If we turn next to an analysis of the opportunities which these various groups have to provide insurance through scientific progress against aggression and depression, we can make our analysis somewhat as follows. In the first place, it is helpful to make the distinction between fundamental science where work is done for the primary object of securing scientific knowledge, and applied science, where the primary object is to develop and produce some technological device which will satisfy some human need or desire.

In the field of fundamental science I believe that past experience, future trends, and the whole logic of the situation would arrange the groups in about this order of priority of opportunity. Using the wartime designations I should assign priority AAA to the universities, AA to industry, A to government, and B to labor. In the field of applied science I believe the priorities would be industry AAA, government AA, universities A, and labor B.

Finally, let me turn to the subject of implementation: What can be done by these various groups to implement their activities, so that scientific progress can be made which will provide a healthy insurance against the dangers of aggression and depression? In many ways I would like to take the positive rather than the negative attitude implied in my subject, and ask the question: What can these groups do to provide the implementation necessary, so that scientific progress will contribute as effectively as possible to the strength and security of our country and to its industrial prosperity and high standard of living? Let me discuss the groups in alphabetical order, starting with government.

Government Activities in Science

There are approximately 40 scientific bureaus in the Government which are principally concerned either with the rendering of informational service to the public, or with the enforcement of regulations in order that various private activities of a technological character can operate with a minimum of interference and a maximum of efficiency in service to the public. There are in addition the various departments of the Army and bureaus of the Navy which are responsible for the development and production of military weapons. Under the category of service to the public come such agencies as the Weather Bureau, Bureau of Standards, Geological Survey, Hydrographic Office, and various bureaus in the Department of Agriculture. Under regulatory agencies are included the Federal Communications Commission, the Civil Aeronautics Administration, and the Bureau of Mines. All these render valuable and essential services. Their healthy operation is necessary for the efficient operations of agriculture, industry, business, and in fact every aspect of our national life.

If we turn to the other aspect of the Government's activities in science, however, we find a peculiar and significant fact—namely, that the Government has turned to the scientific resources of the country for help in times of great national emergency but, with very few minor exceptions, it has not called upon them for help and given them the necessary backing to make this help effective except in great emergency. The record is significant.

It was at the time of the Civil War in 1863 when Congress passed an Act establishing the National Academy of Sciences, and this was approved by President Lincoln as a measure of preparedness and assistance in that time of national emergency. The next great call for help came just before World War I, when in 1916 President Wilson by executive order requested the National Academy of Sciences to establish the National Research Council as an instrument of national preparedness. The next move was in the depths of the great depression, when in 1933 President Roosevelt appointed the Science Advisory Board which, operating through the machinery of the National Academy of Sciences and National Research Council, assisted the various departments of government to reorganize their scientific activities to salvage as much efficient performance as possible in the face of the drastically reduced governmental appropriations. This was a temporary board which was active for two years. The next move came in June 1940 when, with Europe ablaze in war and grave danger that our nation might become embroiled, President Roosevelt set up first the National Defense Research Committee, and one year later enlarged the program by adding a Committee for Medical Research and combining the two under an Office of Scientific Research and Development. It was this agency, generously provided with funds and calling upon the entire scientific resources of the country, which organized, carried through, and coordinated the principal program of research and development for the production of new weapons and devices of warfare and war medicine so effectively during World War II. In 1942, when the sudden Japanese attack had cut our lifelines to the supply of natural rubber, President Roosevelt appointed the Baruch Rubber Survey Committee to review the plans and possibilities for a synthetic rubber program, and to recommend a national program to meet this emergency.

In every one of these cases of desperate national emergency the scientific resources of the country were called upon for help, and in every case this was given with outstanding success to the great benefit of the country. Why is it that, with this lesson on the power of science as an agency for the public welfare, the government has never similarly attempted to mobilize and support the scientific resources of the country for the advancement of standards of living in times of peace and prosperity?

Apparently this question has arisen in many minds as a result of the experience during the last war, and we now have evidence of a desire on the part of various agencies of government to see that scientific progress is more adequately supported than in the past, and that the scientific recourses of the country are in fact mobilized, with necessary implementation, to contribute to national welfare generally.

Most significant in their scope and possibilities are the two pieces of legislation now before Congress: the one to establish an Atomic Energy Commission, and the other to establish a National Science Foundation. We are all so familiar with the nature and objectives of these two pieces of legislation that there is no point in my discussing them now, except to say this: The Atomic Energy Commission or its equivalent is an absolute necessity, not only for the future safety of our country, but also in order that the country may benefit from the possibilities which can now be visualized from the future advances in nuclear science and their applications to a very wide range of objectives involving national security, industry, health, and agriculture. If ever any legislation was in the "must" category, this is an example. If Congress should fail to pass adequate legislation during this session, it will be a catastrophe and a disgrace and will leave the country in a period of doldrums where those who have constructive programs in mind will not have authorization or means to go ahead.

National Science Foundation

The legislation proposing to set up a National Science Foundation is aimed at wide objectives: promotion of progress in fundamental science in both the natural and the social fields, and also a great program of scholarships or fellowships in order that the scientific talent inherent in the population may have full opportunity for education and demonstration, and in order that the deficiency in scientifically trained personnel created by our policies during the past war may be eliminated. Both for security against aggression and security against depression there is no element which is more important than to have the most adequate possible complement of able, well-trained scientific personnel in our country. This is more important in the last analysis than laboratories or factories because, without scientists of the highest caliber, laboratories will be only a delusion and a waste of money, and factories will before long become obsolete.

There is just one thing about this proposed legislation for establishing a National Science Foundation which disturbs many scientists—namely, the danger that it may become a means of political patronage and may tend to bring scientific work of the country under the withering hand of political control. If that should happen the passage of this legislation would be a sorry day for the future of the country. In so far as possible the character of the legislation, and the spirit in which it is carried out after enactment, must be such as to protect science against any control other than that imposed by the scientific ideals of the scientists themselves, which are as high as those of any group in the world and whose effectiveness has been tested by long experience. I am very optimistic that this protection of the scientific work of the country can be maintained, even with the important financial support of scientific work which is an inherent aspect of this legislation and without which it is hard to see how scientific progress can be made adequately under existing economic conditions; but it will require continual vigilance by high-minded citizens in order to defeat any moves which might be made from time to time to degrade science even a few steps down the ladder whose bottom is political patronage, log-rolling, and rackets.

Maintaining Teamwork

Within the War and Navy Departments there are also postwar movements which are highly significant and desirable. Both recognize the advantage of maintaining the teamwork among scientists, industry, and the armed services, so effective during the war. Both have taken steps to perpetuate this teamwork through organization of joint advisory committees and the placing of contracts with civilian agencies for the continuation of basic types of research which show promise or are in fields showing promise of military applications later. These activities are somewhat different from those of the Office of Scientific Research and Development during the war because these latter had to be limited to devices which showed some reasonable promise of becoming useful during the war itself. Now, however, the sights are lifted to the future, and quite advisedly the program is on a more fundamental basis and in many aspects is far less confined by rules of military secrecy. Notable is the Manhattan District, which of necessity has to shoulder the responsibility of carrying on the atomic energy program until congressional legislation on some new agency is enacted and put into effect. There is also a fine job being done by the Office of Research and Inventions in the Navy Department, by the Air Force, the Bureau of Ordnance, the Ordnance Department, the Signal Corps and, to head the list, the recent announcement by General Eisenhower of the establishment of a staff position, parallel with those of the General Staff, for an officer whose primary concern will be research and development and the continued cooperation of military and civilian agencies in the interests of national security. Also in the Navy a new Vinson Bill makes a somewhat analogous provision for enlarging the scope of the Navy's Office of Research and Inventions to put the maintenance of scientific teamwork on a permanently established basis.

All these moves on the part of government are in the right direction and deserve the wholehearted support of every John Q. Citizen who realizes the importance of scientific progress as an insurance against aggression and depression.

Role of Industry

Industry's great role in applied science has been to seize upon promising ideas for commercial exploitation with vision and avidity and to develop them with great skill into desirable products suitable for turning over to the designing, manufacturing, and sales divisions of their companies. Their skill in effecting the transformation from the idea to the product has been highly developed. They have also developed methods for shortening the time lag of this transition. The war afforded many illustrations of this speedup, where the old motto "from research laboratory to freight car equals seven years" could well have been stated in terms of seven months rather than seven years.

Three new trends have come into industrial attitude toward research. Industry's attitude toward research has shown increasing interest in fundamental research, a more liberal interpretation of company policy, and an increasing tendency to cooperate with other companies in the industry or with universities. These three trends are of course closely related.

While every industrial research laboratory must in the last analysis justify itself to the board of directors by its contributions to the business of the company through development of new products or improved methods of production, nevertheless it has been recognized by the most forward-looking companies that it is appropriate for them to engage in a certain amount of fundamental research which does not have an immediate practical objective in view. There are several reasons which contribute to this attitude, and which are responsible for a rapidly increasing emphasis on it at the present time. One of these is that the highest type of productive research man cannot be retained by the companies unless he has at least some reasonable opportunity to work on subjects which incite his scientific curiosity and ambition. Another reason is realization that out of this fundamental research very frequently come ideas which can have a practical application; the company therefore shares responsibility with the rest of the community, but probably has a much more compelling reason than the rest of the community, for developing new scientific knowledge.

A final reason is the fact that a company may wish to keep itself well informed and well advised regarding new scientific developments which are being principally carried on elsewhere but in which the company may wish at any time to enter in a major way when some attractive opportunity presents itself. In order thus to keep well informed and well advised, the company will frequently set up a small research group in its own organization to work in this field, not with the idea that it expects to be the major element in the development of this new branch of

scientific knowledge, but with the idea that it can play its part, if even a minor one, and that only by so doing can it have men on its staff sufficiently intimately informed on the new development to give wise advice to the company management as to when and how it should enter the field in a manner justified by some practical objective which may have appeared reasonably within grasp. A good illustration of this last consideration is the action of a number of industrial companies at the present time to engage in some aspect of research in nuclear science, even though it is recognized that the great government-supported laboratories and the leading educational institutions are carrying the major burden of scientific development and will undoubtedly continue to do so for a long time in the future.

Associated with this factor is the undoubted fact that industrial management has become more liberal in the definition of its responsibility to its stockholders in defining the limitations of its research activities. How frequently some of us who have tried to induce industrial companies to undertake a more active program in purely scientific research, have been met with the reply that this would not be consistent with the responsibilities of management to the stockholders. Now in very many cases the management realizes that its responsibility to the stockholders cannot adequately be discharged over a long term without vigorous support of the scientific research which provides the basic opportunities for industrial research and manufacture of new products for the future. Even those agencies which have long been noted for the prudence of their financial policies and which have even had prudence forced upon them by governmental regulation—businesses like life insurance, trust companies, or investment trusts—have recently become active in advocating the use of at least some small portion of their assets to investment of a venture capital nature. There is the same basic relation in venture capital on the portfolio of an insurance company as there is to a budget item for fundamental research in the program of a manufacturing organization; both are investments in the future and insurance against obsolescence or against the disappearance of future opportunity.

Industry Encourages Research

Finally, the attitude of industry as regards scientific research has become notably more cooperative. This is shown in many ways. A large number of the leading food companies have cooperated to establish the Nutrition Foundation under which are administered their contributions to support fundamental scientific research in this field. It is on the one hand an exhibition of responsibility for public welfare in nutrition, and on the other a forward-looking move in the light of future possibilities in food manufacture. A similar example is the Sugar Foundation or the association of many of the great life insurance companies to support fundamental programs of research on various important aspects of health and disease. It is a move which had been made to a limited extent by public utility companies and by trade associations during the past couple of decades, but has received a notable impetus as a result both of the depression which emphasized its need, and of the late war which demonstrated its possibilities.

Still another illustration of industrial cooperation for the common end of advancing scientific knowledge is found in the much more liberal recent attitude of companies in contributing funds either as gifts or through liberal contracts to educational institutions or other nonprofit-making research organizations engaged in scientific research along promising lines. One group of companies has contributed liberally to education and research in the subject of food technology. Another group has similarly contributed to the development of a program of education and research in the new field of gas turbines and jet propulsion. A number of companies are contributing funds to various university groups who are setting up extensive programs in the field of nuclear science and engineering—programs which are too expensive to be financed through the normal funds available to educational institutions, but which must be carried forward in the public interest both for security and for development of valuable peacetime applications.

There are many other illustrations. In none of them, so far as I know, has there been involved any very special or selfish benefit to the contributing company. Its principal interest is to have the scientific field advanced, to have an adequate supply of young scientists educated in these fields as a reservoir for future possible employment, and in general to be closely in touch with developments pending the time at which the companies themselves may wish to engage actively in certain aspects.

Labor Interests

Traditionally labor has feared one aspect of technological progress—the introduction of labor-saving machinery or methods. This fear received an impetus during the depression of the 1930's, where unemployment reached disastrous proportions but where at the same time industrial management had to find methods of decreasing production costs in order to survive.

The long-term view of the situation, however, leads to quite different conclusions because those industries which, through the introduction of more economic methods of production have been able to bring the cost of a product down within the reach of the average citizen's purchasing power, have thereby greatly magnified the size of the business and the total number of men employed. The automobile and aircraft industries, the incandescent lamp and radio industries, the chemical and oil industries, and the public utility industries, are all notable examples of this fact. All of them have brought, by technological developments, the costs of their product down way below the original costs which depended on hand manufacturing methods. By the use of machine tools and assembly line production costs have gone down and quantities up, sales have enormously increased, and the net employment in production, distribution, sales, and services has reached enormous figures, as have the payrolls. I believe that this fact is now generally recognized by progressive labor leaders and that, except perhaps in times of unemployment emergencies, the more progressive labor unions may be counted on to lend their support to the efforts of management to develop new products and industrial outlets for the future. In this way lies their ultimate protection against obsolescence or defeat through competition.

Building Codes

There are, however, some areas in which intelligent action is needed. One is building codes, many of which stand out as basic obstacles to nation-wide construction of homes and larger institutional building. Some of these codes arise from measures taken to protect health and safety, but many are wholly obsolete in the light of new developments of materials and building designs. Many of the codes, however, were designed to protect labor, and to ensure employment.

Whenever any regulation or code or other obstacle in agreement or legislation stands in the way of utilizing the most advanced and improved techniques of production, or of erection and assembly, or of design, these restrictions act to the immediate disadvantage of the public and to the ultimate disadvantage of labor. More employment and better pay for less hours of work can be attained if every advantage is taken of technological progress to produce the best possible product at the lowest possible cost. Labor has its great stake, along with all the rest of the population in scientific progress.

Problems of Universities

Turn finally to some of the problems and trends in the universities. No one can maintain the thesis that the universities are the sole source of basic new scientific knowledge, but I believe everyone must accept the fact that they have been and will continue to be the major source. There are many logical reasons for this, such as independence from practical directives, presence of generation after generation of eager graduate students to provide continual fresh manpower, supplementing the abilities of the staff, and the appeal which the relative freedom of

university life makes to men of scientific bent. But whatever the reasons may be, as well informed a person as Roger Adams said, in his presidential address before the AMERICAN CHEMICAL SOCIETY some 15 years ago, that 95% of the products of American chemical industry had their origin in university laboratories. Somewhat the same thing is true in the field of electronics. It is wholly true thus far in the new field of nuclear science and atomic energy. It is almost wholly true in the field of medicine if we include the great hospitals and medical institutes, as I have done, under the broad designation of "university".

What is important for our purposes is not to belabor this point, but to call attention to certain significant trends in university research as to its organization and support. While these trends have been developing over a number of years, they have received enormous impetus as a result of experience gained during the past war.

In general terms one can certainly say that the importance of scientific research and graduate work in our educational institutions is more widely recognized now than it ever was before. For 20 or 30 years scientific research has held a high place in our educational institutions. It is going to hold a higher place in the future. For considerably less time research work has had a recognized role in our engineering schools. Here, in general, research has not reached the same levels of importance, advanced character, or expert handling which scientific research has attained in the universities, but there is in progress now a very powerful trend in our engineering schools to increase emphasis on research and raise its standards.

Organized Research Programs

The most important new development, however, in our universities is the emergence of the recognized "research program" as differentiated from the multiplicity of more or less unrelated "research projects". These research programs are large projects built around very important objectives and generally involve the cooperative effort of men from various departments and with various specialties. They involve some sort of special organization within the university which is different from the ordinary department because it is not particularly involved with curriculum or degrees, although it may contribute to both. It generally requires very substantial financial support which usually has to be secured from sources outside of the regular funds available to the institution, the sources such as the great foundations, or government, or contributions by industry, or wealthy individuals.

Among the first of these great institutional research programs in the field of the natural sciences, which I know best, is the Radiation Laboratory at the University of California in Berkeley, under the leadership of Ernest Lawrence and built around his great program for development and use of cyclotrons and related equipment. Another illustration before the war was the Center of Analysis at the Massachusetts Institute of Technology, which was concerned with the development of a considerable variety of mechanical or electrical instruments for performing complicated mathematical operations—instruments like the differential analyzer, the cinema-integraph, the spectrum analyzer, the rapid selector, the function unit, and certain statistical machines.

Since the war, or at least since the last stages of the war, some notable new examples of such great institutional "research programs" have arisen. For example, the University of Chicago has announced four research institutes associated with various aspects of nuclear science and its applications. At the Massachusetts Institute of Technology we have established the Electronics Laboratory as a cooperative enterprise between our Department of Physics and Electrical Engineering, and carrying on somewhat the tradition of the MIT Radiation Laboratory during the war, but with our sights on fundamental science rather than on military applications. At MIT we have also established a Laboratory of Nuclear Science and Engineering, now housed in temporary quarters, but with authorization for an adequate laboratory as soon as this can be constructed. This is a cooperative enterprise between the departments of physics, chemistry, metallurgy, electrical engineering, mechanical engineering, and biology.

I know that there are similar illustrations in other educational institutions, all having in common the following factors. A great opportunity in scientific research is recognized. A cooperative organized program is set up to achieve results in the most expeditious and efficient manner possible. Combined with the ambitions for the discovery of new knowledge is the responsibility for the training of research workers who will be in demand by industry, the Government including the armed services, and other educational institutions in these particular fields. Very substantial financial resources are required for these institutions, in many cases annual funds which may be considerably greater than those which supported whole departments of the institutions in the prewar days. The source of these funds thus far is found in government and industry which recognize the importance of these fields for their own legitimate purposes and whose more liberal policies are developed to permit such support of scientific research programs at their source in the universities. Finally, there is another healthy aspect of this situation —namely, that these organized groups in various institutions are showing a most desirable tendency for interinstitutional cooperation, so that this program within the institutions is actually in many cases a national program involving the institutions, industry, and government.

Conclusion

It seems to me that the foregoing analysis of the situation and trends in the field of science justifies us in looking forward to the future with a considerable degree of faith and enthusiasm. It is a recognized axiom of biology and of sociology that any organism or organization which ceases to develop is thereby automatically on the road to decay. Vigorous development is an index of the likelihood of survival. We are now in an era of vigorous development both of science itself and the techniques of organization, administration, and support, which form the environment in which scientific progress can be made.

The trends which I have described must be encouraged, supported at every turn, increased in scope, and, by general public education, carried on with increasing understanding and support of the average public.

The other important point is that scientific work and scientific workers and scientific institutions cannot survive and prosper unless the general environment is favorable. It is like the saying, "No man liveth to himself alone". Science does not live to itself; it only lives as it contributes usefully to other aspects of society, and it lives only if certain other essential aspects of society are in a healthy state to provide the necessary environment. These other aspects of society include many of the subjects which are most prominently before us, and in fact before the whole world today. They involve such matters as international peace, the healing of the wounds created by the war, the relations between management and labor which, if handled successfully, can lead to a most productive teamwork for the benefit of all and which, if handled unsuccessfully, can lead to national, or even international, chaos. They include governmental policies, such as the extent to which Mr. John Q. Citizen is to be regimented. They include the financial policies which can bankrupt the nation or, through inflation, lead to the wiping out of all the reservoirs for free enterprise, if unwisely handled.

So those of us who are greatly interested in the contributions which science can make to national welfare must have also an intelligent and effective interest in these environmental aspects which affect not only the opportunities for scientific progress, but every aspect of our national life and individual happiness.

Finally I would pay a tribute to the Westinghouse Co. itself, which through sponsoring and making possible this forum has by that very act made a most significant contribution to the subject of my address, "Scientific Progress—Insurance against Aggression and Depression".